Use of the C-PVC Electrode for the Electrooxidation of Dopamine, Ascorbic Acid and, Uric acid

Rocio Aguilar,[1] Martin Dvila,[2] Mara de la Paz Elizalde,[3] Rutilo Silva,[4] Jurgen Mattusch[5] and Rainer Wennrich[6]

[1]Universidad Autnoma de Puebla
Apartado postal J-55
Puebla, Puebla 72571
Mexico

[2]Universidad Autnoma de Puebla
Apartado postal J-55
Puebla, Puebla 72571
Mexico

[3]Universidad Autnoma de Puebla
Apartado postal J-55
Puebla, Puebla 72571
Mxico

[4]Universidad Autnoma de Puebla
Apartado postal J-55
Puebla, Puebla 72571
Mxico

[5]Center for Environmental Research
Dept. of Analytical Chemistry
Permoserstr. 15
Leipzig, Leipzig 04318
Germany

[6]Center for Environmental Research
Dept. of Analytical Chemistry
Permosertr. 15
Leipzig, Leipzig 04318
Germany

Use of the C-PVC electrode for the electrooxidation of dopamine, ascorbic acid and uric acid

R. Aguilar (1), M. M. Dvila* (2), M. P. Elizalde (3), R. Silva (1), J. Mattusch (4), R. Wennrich (4) (1) Instituto de Fsica, (2) Facultad de Ciencias Qumicas, (3) Centro de Qumica. Universidad Autnoma de Puebla, Mxico (4) Center for Environmental Research, Dept. of Analytical Chemistry, Leipzig, Germany

Keywords: Carbon-polyvinylchloride electrodes, dopamine, ascorbic acid, uric acid

The electrochemical determination of dopamine (DA), ascorbic acid (AA) and uric acid (UA) was studied using carbon-polyvinylchloride (C-PVC) composite as electrode in acidic solution 0.1 M H2SO4 and phosphate buffer solution pH 7.4. For the analytical determination differential pulse voltammetry and cyclic voltammetry were used. The electrochemical response of C-PVC electrodes was compared with and contrasted to those obtained at an aged C-PVC and at a conventional-sized vitreous carbon electrode. The electrooxidation of 160 M DA in acidic solution occurred at 0.514 V vs. Ag/AgCl (3 M KCl) on C-PVC and on glassy carbon at 0.645 V. A linear relationship between Ip and the concentration of DA was obtained for the two electrodes. However, on the C-PVC electrode the detection limit was greater. In the case of the binary solution of 160 M DA + 1 mM AA the difference between the potentials of the respective oxidation peaks on C- PVC was about 0.262 V in acidic solution and 0.197 V in buffer solution. For the same binary solution on glassy carbon a broad peak was observed at about 0.7 V both in 0.1 M H2SO4 and pH 7.4 buffer solutions. This electrochemical response of the C-PVC can be due to the structure and morphology of the carbon surfaces. A mixture containing 0.1 mM uric UA + 0.2 mM AA + 0.16 mM DA in 0.1 M phosphate buffer solution (pH 7.4) was tested with the C-PVC electrode aged by long potential cycling. The anodic current peak for DA appeared at 0.254 V and for UA and AA peaks overlapped around 0.420 V. Using a glassy carbon electrode under the same conditions a broad anodic peak around 0.576 V was observed. This behavior can be associated with the changes in the surface composition and morphology of the composite electrodes after aging as it was observed by EDS and SEM analysis.

References 1. L. Xiao, J. Chen, C. S. Cha. J. Electroanal. Chem. 446 (2000) 27 2. J. Chen, C. S. Cha, J. Electroanal. Chem. 463 (1999) 93 3. E. S. Forzani, G. A. Rivas, V. M. Sols, J. Electronal. Chem. 435 (1997) 77 4. L. Falat, H.-Y. Cheng, Anal. Chem. 54 (1982) 2111

Acknowledgments: CONACyT for a fellowship to R. Aguilar.